

Alternative Energy

Edited by

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Table of Contents

Table of Contents	v
Preface	viii
Chapter 1	
The Impact of energy utilization on environment.....	1
M.N.A. Hawlader	
Chapter 2	
Desalination of Seawater to provide fresh water	9
M.N.A. Hawlader	
Chapter 3	
A solar assisted desalination system using heat pump.....	16
M.N.A. Hawlader, Leong Chiing Yang	
Chapter 4	
An experimental study of a phase change storage system.....	23
M.N.A. Hawlader and Smita Panga	
Chapter 5	
Moisture migration in a grain column subjected to drying	30
M.N.A. Hawlader and Md. Shafique J. Chowdhury	
Chapter 6	
Solar Drying of Guavas, Papayas and Apples	38
M.N.A. Hawlader and Lee Hwee Peng	
Chapter 7	
Drying under inert environment: the quality of Mango and Rockmelon.....	47
M.N.A. Hawlader and Pan Jiahe	
Chapter 8	
A low temperature flat plate solar collector	53
M.N.A. Hawlader, M. Zakir Ullah and Maung Than Htut	
Chapter 9	
Optimization of an integrated solar heat-pump system.....	60
M N A Hawlader and Ye Shaochun	
Chapter 10	
Comparative study of performance characteristics using <i>Jatropha</i> Oil Methyl Esters Biodiesel and Diesel.....	69
A.K.M. Mohiuddin and Azan Mohd	
Chapter 11	
Comparative Study of Emission Characteristics using <i>Jatropha</i> Oil Methyl Esters Biodiesel and Diesel	74
A.K.M. Mohiuddin and Azan Mohd	
Chapter 12	
Waste Cooking Oil Utilization for Biodiesel Production.....	79
A.K.M. Mohiuddin and Nabeel Adeyemi	
Chapter 13	
Flow Characteristic of Mixing Impeller for Liquid-Liquid Mixing	85
A.K.M. Mohiuddin and Nabeel Adeyemi	
Chapter 14	
Solar Energy Management for Poverty Alleviation and Income Generating Activities.....	91
A.K.M. Mohiuddin	

Chapter 15	
	Turbulence model for axial mixing impeller in unbaffled vessel..... 97
	A.K.M. Mohiuddin, Nabeel Adeyemi and Muhamad Husaini
Chapter 16	
	Optimization and economic analysis of a solar assisted heat pump drying system..... 103
	M.N.A. Hawlader, S. M. A. Rahman and K.A. Jahangeer
Chapter 17	
	A solar heat pump water heater for rural hospitals 117
	M.N.A. Hawlader and M. Zakir Ullah
Chapter 18	
	A solar heat-pump system for air-conditioning, water heating and drying 126
	M N A Hawlader, K A Jahangeer, Ye Shaochun and Choy Tack Hoon
Chapter 19	
	Engineering design – An approach to the development of creativity 132
	M.N.A. Hawlader
Chapter 20	
	Analysis of Engine Performance with NGV 140
	Sany Izan Ihsan, Nabila Sulaiman, AKM Mohiuddin and Maizirwan Mel
Chapter 21	
	Analysis of Engine Performance with Enhanced Fuel..... 147
	Sany Izan Ihsan, Khairussani Farid, Maizirwan Mel, and AKM Mohiuddin
Chapter 22	
	CFD analysis of an evacuated solar still..... 156
	Ahmad F. Ismail, Mirghani I. Ahmed, Yousif A. Abakr
Chapter 23	
	Developments on Solar Operated Water Desalination..... 163
	Mirghani I. Ahmed, Yousif A. Abakr and Ahmad F. Ismail
Chapter 24	
	Theoretical and experimental evaluation of LPG as refrigerant for domestic refrigerators and freezers 169
	M.M. El-Awad, M.I. Ahmed
Chapter 25	
	Preliminary investigation of biodiesel reactor optimization using combine CFD-Taguchi method 179
	A.K.M. Mohiuddin and Nabeel A Adeyemi
Chapter 26	
	Alternative mixing strategy for biodiesel production: mixed flow impeller characterization 188
	A.K.M. Mohiuddin and Nabeel Adeyemi
Chapter 27	
	Experimental Investigation of a Multistage Evacuated Solar Still 197
	Yousif. A. Abakr, Ahmad F. Ismail and Mirghani I. Ahmed
Chapter 28	
	Modelling of electronics heat sink – Influence of the wake function generation on the accuracy of CFD analysis 203
	M. I. Ahmed, A. F. Ismail, Y. A. Abakr
Chapter 29	
	The effect of the operating conditions on the apparent viscosity of crude palm oil during separation..... 213

Sulaiman Al-Zuhair, Yousif A. Abakr and Mirghani I. Ahmed

Chapter 30	
Thermal analysis of a micro device used for detection of colorectal cancer.....	220
Mirghani I. Ahmed, Meftah Hrairi	
Chapter 31	
Performance of different photovoltaic cells operating under the meteorological conditions of Singapore.....	229
M.N.A Hawlader, Lee Poh Seng and Chua Kok Kiang	
Chapter 32	
Analyses of motion and drag coefficient of water droplets in a natural draught cooling tower.....	240
Liu Baomin and M. N. A. Hawlader	
Chapter 33	
A solar assisted heat pump system for desalination.....	252
Zakaria Mohd. Amin, M N A Hawlader and Azharul Karim	
Chapter 34	
Comparative study of combustion characteristics using Jatropha oil methyl esters biodiesel and diesel.....	261
A.K.M. Mohiuddin and Azan Mohd	
Chapter 35	
Performance of evaporator collector and air collector in a solar assisted heat pump dryer.	269
S. M. A. Rahman and M. N. A. Hawlader	

Chapter 22

CFD analysis of an evacuated solar still

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Abstract

A mathematical model for an evacuated solar still is presented in this work. Fluent software is used to model and simulate the evaporation and condensation processes inside the solar still. The simulation results showed the transient state of the evaporation and condensation inside the still and the vapour stream lines inside the solar still. Simulation results showed vapour path lines patterns similar to those visualized experimentally in previous literature.

Keywords: solar desalination, modeling, simulation, visualization.

INTRODUCTION

The non-availability of pure water presents a serious problem in many parts of the world. Rivers, lakes and underground water reservoirs has been the major source for fresh water requirements in domestic live, agriculture and industry. However use of water from such sources is not always possible because of the presence of large amount of salts and harmful organisms. The impact of many diseases affecting mankind can be drastically reduced if fresh hygienic water is provided for drinking. Further more, the rapid growth in industry and population all over the world has resulted in a large escalation in demand for fresh water, this leads to an acute fresh water shortage. While an infinite water resource of seawater are available on the earth, but there are large desert/or arid areas. There is definitely a need to produce fresh water from seawater in the 21st century by using much larger scale desalination systems than those in the present century. Solar energy can be used for producing fresh water for biomass growth as well as for potable water.

The present desalination plants of the world now produce approximately 4 billion gallons daily, enough to provide about 4 percent of the world's population with fifteen gallons a day. This is equivalent to providing about one-quarter of one percent of the world's fresh water needs.

Solar still, in many respects, is an ideal source of fresh water for both drinking and agriculture; it is one of the important and technically viable applications of solar energy. There are many types of solar still; the simplest and the more proved one is the basin type. Investigations showed that the basin type solar still has been found to be of limited performance.

The double basin still, diffusion still, and the multiple effects still are of better performance than the basin type solar still.